Tech Update

Juni 2007, Århus-København

Mikkel Brodersen
SE, Cisco Systems
mikkel@cisco.com
Agenda

• Introduktion
• Catalyst intelligent switching fordele
• Catalyst Switching produkter
  • Catalyst 4500 & C4900
  • Catalyst 6500
  • Catalyst 2960 & Catalyst 3560/3750
Cisco Market Positioning and Experience

FY06 Net Sales:
$28.484B
- Products $23.917B
- Services $4.567B

FY06 Product Sales:
- 45.3% switching
- 25.1% routers
- 26.0% Advanced Technologies

R&D Investment:
$4.067 B or 17% of Net Product Sales

- Very high investment level in developing new technologies and ASIC to address new requirements
- Strong Experience in solution and architecture on Enterprise and SP
- Proven ability to provide very large end-to-end solutions
- Solid support organization to Partners and Customers

From FY06 Annual report published on www.cisco.com
Layer 3 – Data Link
Scalable L3 Forwarding Architecture

1st packet of every “NEW” flow is handled by the CPU (Slow path)
In a dynamic environment, the actual performance of switch is limited by
the capacity of the Switch CPU. Important for environment like University Campuses.

Cisco Express Forwarding is available on All Catalyst Platforms
## Cisco: The Technology Innovator

**Innovations Turned Standards or Adopted by Industry**

### CORE TECHNOLOGIES

**SWITCHING INNOVATIONS**

- Fast Ethernet → 802.3ad
- EtherChannel → 802.3w
- ISL → 802.1q
- Uplink Fast → 802.1w
- Multiple STP → 802.1s
- Inline power → 802.3af

**ROUTING INNOVATIONS**

- HSRP → VRRP
- QoS (LLQ, WRED, etc.) → Adopted
- FR Cisco LMI → LMI
- Integrated Security (FW, IDS, VPN) → Adopted
- MPLS → RFC 3031

"Maximum differentiation is derived not from a single product, but by system and topology integration"
Catalyst LAN Switching

Product Overview

Catalyst 4500 & Catalyst 4900
### Catalyst Modular Solutions

**Investment Protection through life cycle and scalability**

<table>
<thead>
<tr>
<th>FEATURES / TIME</th>
<th>L2 1999</th>
<th>L3 2001</th>
<th>10/100/1000 2002</th>
<th>802.3AF 2003</th>
<th>10GE 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>Capex</td>
<td>Capex</td>
<td>Capex</td>
<td>Capex</td>
<td>Capex</td>
</tr>
<tr>
<td><strong>Platform Upgrade Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capex Savings with Catalyst Chassis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Catalyst C4500 & 6500**
- **Low Cost Competitors**
Catalyst Switching Portfolio

Features, Scalability, Longevity

Distribution/Core
- Catalyst 4500
- Catalyst 6500

Datacenter Access
- Catalyst 4948
- Catalyst 6500

Wiring Closet
- Blade Switches
- Catalyst 29xx
- Catalyst 3560
- Catalyst 3750
- Catalyst 4500
- Catalyst 6500

Number of Employees/Density
- Small
- Medium-sized
- Large
Catalyst 4500 Series Milestones

Most Widely Deployed Modular Ethernet Architecture in the Industry

Catalyst 4000

Catalyst 4500

425,000 Chassis Shipped All Time!

Over 60 Million Ports Shipped!
Catalyst 4500 Architecture
4500 utilizes a Centralized Architecture

- Catalyst 4500 is a shared memory switch
- All forwarding, queuing, security is implemented on the Supervisor
- The individual line cards are considered to be ‘transparent’
  - Contain simple “stub” ASIC’s and the PHY’s
  - No buffering or local switching
- Each line card has 6 dedicated 1 Gbps (full duplex) connections to the central forwarding engine
Cisco Catalyst 4500 Series
Scalable Architecture

Centralized switching engine
• Scalable forwarding and services
• Redundant Option with 4507R/10R
• Wire-speed intelligent services
• Dynamic shared memory
• Ultra-low latency

Passive backplane
• 64-136Gbps capacity
• Scalable point-to-point
• Highly Reliable with no active components

Flexible line cards
• Functionally transparent
• Slot/chassis independent
• 384 port/chassis—10/100/1000 (fiber or copper)
**Investment Protection**
Architecture Designed to Evolve as Technology Evolves

In this example, Supervisor II represents only 15% of the Original Purchase Price

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis</td>
<td>12%</td>
</tr>
<tr>
<td>Dual AC Power</td>
<td>5%</td>
</tr>
<tr>
<td>Supervisor II</td>
<td>15%</td>
</tr>
<tr>
<td>6 Port GBIC</td>
<td>7%</td>
</tr>
<tr>
<td>2*48-port 10/100</td>
<td>24%</td>
</tr>
<tr>
<td>2*48 port 10/100/1000</td>
<td>27%</td>
</tr>
<tr>
<td>8 GBICs</td>
<td>10%</td>
</tr>
<tr>
<td>Initial Investment</td>
<td>100%</td>
</tr>
</tbody>
</table>

Catalyst 4506 with Supervisor II

Supervisor II-Plus

85% of initial investment is maintained!

Upgrade **ONLY** the Supervisor to upgrade the capabilities of **ALL** Ports
Catalyst 4500: Continued Innovation & Investment Protection

Forward/Backward Compatibility

SAME LINE CARDS


Layer 2  10/100/1000  10-GbE SSO  ISSU  Development
PoE  L2/3/4  NAC NSF  CoPP

Extended Lifecycle
Catalyst 4500 Enhanced L3 Supervisor Options

**Supervisor V-10GE**
- Support **Maximum densities** (Catalyst 4510R—384 ports)
- Advanced Layer 3 switching/routing (OSPF, EIGRP, IS:IS)
- Highly scalable Layer 2/3/4 services
- Supports 136 Gbps + 102 Mpps with 10GE Uplinks
- Redundancy Support in 4507R & **4510R**
- Catalyst 4503, 4506, 4507R, **4510R**

Optional NetFlow Daughter Card

**Supervisor V**
- Support for **higher densities** (Catalyst 4510R-336 ports)
- Advanced Layer 3 switching/routing (OSPF, EIGRP, IS:IS)
- Highly scalable Layer 2/3/4 services
- Supports 96Gbps + 72Mpps
- Redundancy Support in 4507R & **4510R**
- Catalyst 4503, 4506, 4507R, **4510R**

Optional NetFlow Daughter Card

**Supervisor IV**
- Optimized for **medium** networks
- Advanced Layer 3 switching/routing (OSPF, EIGRP, IS:IS)
- Scalable Layer 2/3/4 services
- Supports 64Gbps + 48Mpps
- Redundancy Support in 4507R
- Catalyst 4503, 4506, 4507R

Optional NetFlow Daughter Card
Catalyst 4500 Basic L3 Supervisor Options

**Supervisor II-Plus-10GE**
- Optimized for **Medium L2** networks
- Basic Layer 3 switching/routing (RIP, Static, EIGRP Stub)
- Layer 2/3/4 intelligent services
- Supports up to 108Gbps + 81Mpps
- 4x GE and 2x 10GE Uplinks
- Redundancy support in 4507R chassis
- Catalyst 4503, 4506, 4507R Chassis

**Supervisor II-Plus**
- Optimized for **Smaller L2** networks
- Basic Layer 3 switching/routing (RIP, Static, EIGRP Stub)
- Layer 2/3/4 intelligent services
- Supports up to 64Gbps + 48Mpps
- Redundancy support in 4507R chassis
- Catalyst 4503, 4506, & 4507R Chassis

**Supervisor II-Plus TS**
- Optimized for **Small L2** networks
- Provides 20 wire-rate GE ports on the face
- 12 Copper ports IEEE PoE with any power supply
- Basic Layer 3 switching/routing (RIP, Static, EIGRP Stub)
- Layer 2/3/4 intelligent services
- Supports up to 64Gbps + 48Mpps
- Catalyst **4503 only** (up to 116 ports)
Delivering Non-Stop Operations
Full Image ISSU Maximizes Total System Availability

Eliminates Planned Outages

Safeguard Against Unplanned Outages

ISSU
Eliminates Planned Maintenance Outages

High Feature Capacity
Prevents Performance Degradation
Ensures Seamless Recovery

NSF/SSO
NSF/SSO Prevents Performance Degradation
Ensures Seamless Recovery

CoPP
Protects Against CPU Overload

Hardware Redundancy and Detection
Safeguards Against Unpredictable Outages

Delivering “Non-Stop” Operations

Availability
High Availability—
Hardware Redundancy for the Most Complex Components

- Power Supplies (1+1)
- N +1 Redundant Fans
- Supervisors (1+1) with SSO
- Simple Line Card Design
  MTBR up to 6X HIGHER than Supervisors, Fans and Power Supplies
- Less Components = Less Likely to Fail

Phone calls do not drop
Videos do not freeze
Cisco Catalyst 4900 Series Switch Overview

- Two models: 2 10-GigE uplinks or 4 SFP
- Nonblocking 48 ports of 10/100/1000
- 1 RU form factor
- Cisco IOS® Software/Cisco® Express Forwarding-based Layer 2/3/4 switching
- Dual, hot-swappable, internal power supplies (AC or DC options)
- Hot-swappable fan tray
- Jumbo frames on all ports
- Broadcast and multicast suppression in hardware for all ports (L2/3)
- Nonstacking
- Based on Cisco Catalyst® 4500 Series Hardware

David Newman, President of Network Test
Cisco Catalyst 4900 Series Switch

Hardware Options

**Performance**
- Designed for low latency
- Wire speed on all ports
- Cisco® Express-based forwarding

**High Availability**
- Redundant, hot-swappable power supplies and fans
- Variable speed removable fan tray
- In-service field replacements

**Power supply choices**
- Single or dual internal power supplies
  - AC or DC
  - AC to DC failover—unique for fixed switches
Roadmap præsentation
Catalyst Switching Portfolio

Number of Employees/Density:
- Small
- Medium-sized
- Large

Features, Scalability, Longevity:
- Wiring Closet
- Datacenter Access
- Distribution/Core

Models:
- Catalyst Express 500
- Catalyst 29xx
- Catalyst 3560
- Catalyst 3750
- Catalyst 4500
- Catalyst 4948
- Catalyst 6500
- Catalyst 4500
- Catalyst 6500
- Catalyst 6500
Catalyst LAN Switching
Product Overview

Catalyst 6500
Catalyst 6500 Family
New “E” Series Chassis

New E Series chassis designed to support much higher loads of power across the backplane - ideally suited for large deployments of inline powered devices...

<table>
<thead>
<tr>
<th>New Catalyst 6500 “E” Series Chassis Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready for 80G / slot</td>
</tr>
</tbody>
</table>
Cisco Catalyst 6500 – Leading the Campus Communication Fabric Evolution

- 400,000 systems deployed
- Campus Backbone, Datacenters, Wiring Closet
- WAN Edge and Metro Ethernet & SP
- End to end software & operational consistency
- Common hardware sparing
- Safe Harbor
Catalyst 6500 UNIQUE Value Propositions

<table>
<thead>
<tr>
<th></th>
<th>Backbone</th>
<th>DC/High Performance Access</th>
<th>Wiring Closet Access</th>
<th>EWAN Service Aggregation/ Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2Tbit system roadmap</td>
<td>Virtual Switching</td>
<td>Core/Dist Feature consistency</td>
<td>Virtualized Services</td>
</tr>
<tr>
<td></td>
<td>264 10GE ports/system</td>
<td>10GE-T (802.3an)</td>
<td>Integrated Security</td>
<td>Application Optimization</td>
</tr>
<tr>
<td></td>
<td>Virtual Switching</td>
<td>1000+ GE Ports/system</td>
<td>Application Intelligence</td>
<td>6524-10GE, self-managed MAN</td>
</tr>
<tr>
<td></td>
<td>Network Virtualization</td>
<td>Resource Mgmt (EEM, V-Frame)</td>
<td>PoE Scalability &amp; Port Density</td>
<td>Scalable IPSec Solutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmentals (Power, cabling)</td>
<td>Instrumentation (Netflow,ERSPAN, NAM)</td>
<td>Routing Leadership (MPLS, IPv6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Scalable Service Flexibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Software Modularity**

<table>
<thead>
<tr>
<th></th>
<th>ISSU</th>
<th>Safe Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>EEM</td>
<td>Call Home</td>
</tr>
<tr>
<td>SNMP</td>
<td>Smart Port</td>
<td>Rollback</td>
</tr>
<tr>
<td>Netflow</td>
<td>NAM</td>
<td>NBAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERSPAN</td>
</tr>
</tbody>
</table>

32 gigabit to 4 Terabits Capacity
Catalyst 6500 Architecture
With Supervisor 720

- Supervisor Engine 720
- MSFC3
- PFC3
- CEF256 Series
- dCEF256 Series
- Classic Series

CEF720 Series
- Optional DFC3

16 Gbps Switching Bus

PFC3
- Hardware Fwd Tables
- 20
- 20
- 20
- 20

CEF720 Series
- 30–400 Mpps “Pay as you Grow” Forwarding

Integrated Switch Fabric

dCEF720 Series
- Integrated DFC3

Optional DFC3

CEF256 Series
- Integrated DFC3
Catalyst 6500 Supervisors
Enable Consistent Features Across Your Entire Network

End-to-End feature consistency & IOS Software Modularity!

<table>
<thead>
<tr>
<th>Supervisor 720</th>
<th>Supervisor 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core, Distribution &amp; Data Center</td>
<td>Access &amp; WAN Edge</td>
</tr>
</tbody>
</table>

Hardware Accelerated Services and Forwarding Across Both Supervisors:

<table>
<thead>
<tr>
<th>IPv4</th>
<th>IPv6</th>
<th>QoS</th>
<th>MPLS</th>
<th>Port ACL’s</th>
<th>NAT</th>
<th>GRE</th>
<th>Multicast</th>
</tr>
</thead>
</table>

Security
- Catalyst Security Toolkit
- Identity Based Networking (IBNS)
- Network Admission Control (NAC)
- Control Plane Policing
- Svc Modules (FW, IDS, AD, VPN)
- HW-based L2 MAC Learning

Multicast
- Bi-Directional PIM
- IGMP Querier
- RGMP, MBGP
- PIM Snooping
- IGMP v3 and SSM
- MSDP

High Availability & Quality
- Software Modularity
- Soft HA
- GOLD
- L2 / L3 Sub-Second Switchover
- Non-Stop Forwarding
- Safe Harbor and FTL
Supervisor 720
Industry Leading Performance & Investment Protection

• Integrated 720Gb Switch Fabric
• Dual 20Gbps connection / slot
• Dual speed 8Gb / 20Gb Traces
• Line rate Buffering

Sup720 leverages hardware to scale performance for advanced services....

Optimized for Secure & Mission Critical Deployments
• Modular PFC Daughter Card for Maximum Investment Protection
• Industry Leading Security Features:
  • HW Acceleration for RP Rate Limiters, Port ACL’s, Multipath uRPF Check, ACL Counters
• Scalable Services for Optimal Application Support:
  • HW Acceleration for BI-DIR PIM, MPLS, GRE, NAT, PAT, IPv6
Supervisor Engine 32
Next generation supervisor for the intelligent wiring closet

- Next generation supervisor for the intelligent wiring closet
- Offers upgradeability, flexibility, and intelligent services
- Classic supervisor engine—no fabric, uses 32Gbps bus
- Two uplink options:
  - 8xGE SFP + 1x 10/100/1000 RJ-45
  - 2x10GE XENPAK + 1x 10/100/1000 RJ-45
### Catalyst 6500 Linecards

#### Latest Core, Distribution, and Data Center Portfolio

<table>
<thead>
<tr>
<th>Linecard</th>
<th>Description</th>
</tr>
</thead>
</table>
| WS-X6708-10GE | 8 Port 10GE X2 (2x20G Fabric Enabled Card)  
ER, LR, LX4, SR, CX4 optics; DFC included; Queuing: TX - 1p7q8t, RX - 8q8t; Jumbo frame support: 90MB/port TX Buffer |
| WS-X6704-10GE | 4 Port 10GE XENPAK (2x20G Fabric Enabled Card)  
ER, LR, LX4, SR, CX4, ZR optics; Optional DFC; Queuing: TX - 1p7q4t, RX - 1q8t or 8q8t (w/DFC); Jumbo frame support |
| WS-X6748-SFP | 48 Port GE SFP (2x20G Fabric Enabled Card)  
SX, LX, ZX, Tx, CWDM SFPs; Optional DFC; Queuing: TX - 1p3q8t, RX - 1q8t or 2q8t (w/DFC); Jumbo frame support |
| WS-X6724-SFP | 24 Port GE SFP (1x20G Fabric Enabled Card)  
SX, LX, ZX, Tx, CWDM SFPs; Optional DFC; Queuing: TX - 1p3q8t, RX - 1q8t or 2q8t (w/DFC); Jumbo frame support |
| WS-X6748-GE-TX | 48 Port 10/100/1000 (2x20G Fabric Enabled Card)  
Supports TDR; Optional Distributed Forwarding Card (DFC); Queuing: TX - 1p3q8t, RX - 1q8t; Jumbo frame support |
### Catalyst 6500 Linecards
### Latest Wiring Closet Portfolio

<table>
<thead>
<tr>
<th>Linecards</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WS-X6148A-GE-TX</strong> <a href="image">Image</a></td>
<td><strong>48 Port 10/100/1000 Wiring Closet Card ($7,000) with PoE Option</strong>&lt;br&gt;Integrated TDR, deeper per port buffers (5.2Mb), jumbo frames, Q-in-Q, 4 TX queues (one with strict priority), WRED</td>
</tr>
<tr>
<td><strong>WS-X6148A-RJ-45</strong> <a href="image">Image</a></td>
<td><strong>48 Port 10/100 Wiring Closet Card ($6,000) with PoE Option</strong>&lt;br&gt;Integrated TDR, deeper per port buffers (5.2Mb), 4 TX queues (one with strict priority), WRED</td>
</tr>
<tr>
<td><strong>WS-X6196-RJ-21, WS-X6148X2-RJ-45</strong> <a href="image">Image</a></td>
<td><strong>96 port 10/100 Wiring Closet Cards ($10,500) with PoE Option</strong>&lt;br&gt;Supports strict priority queue, receive queue type 1p1q0t, transmit queue type 1p3q1t, buffers – 28K Rx, 1088K Tx</td>
</tr>
<tr>
<td><strong>WS-X6148-FE-SFP</strong> <a href="image">Image</a></td>
<td><strong>48 Port 100FX Card ($9,000)</strong>&lt;br&gt;Optics supported – FX, LX, BX-U and BX-D; Deep per port buffers (5.2Mb), 4 TX queues (one with strict priority), WRED</td>
</tr>
</tbody>
</table>
Backbone Update
Catalyst 6500 Campus Backbone
Key Areas of Investment

**Scalability/Performance**
- 2T per system
- 10GE density
- Virtual Switching System
- Predictable Performance
- IP Services Scalability (Multicast etc)

**Non-Stop Communications**
- In Service Software Upgrade (ISSU)
- IOS Modularity
- NSF/SSO
- Physical Redundancy
- Control Plane Policing

**Virtualization**
- Virtual Switching System
- Network Virtualization: MPLS, VRF, VNETs
- Virtualized Services: FWSM, ACE

**Integrated Services**
- Scalable Wireless Integration (WISM)
- Integrated Security: IDSM2, FWSM
- Performance Monitoring: NAM
- Application Monitoring: Netflow
Catalyst 6500
8 Port 10GE Linecard

**IOS: 12.2(18)SXF5**

WS-X6708-10GE-3C
WS-X6708-10GE-3CXL

**64 Gbps Local Switching**
- 8 x 10GE ports (X2 Optics)
- 110MB buffer / port – ingress, 90MB buffer / port – egress
- Integrated DFC3C or DFC3CXL (No CFC option)
- All ports VSL Capable
- Egress Shaping (SRR, DWRR)

“We pushed the 6708 to the limit with all channels loaded, and we were able to achieve multiple ten gigabits per second… The Cisco equipment performed admirably…”
### Catalyst 6500 Backbone Leadership: Whitney 1 Features

#### Non-Stop Communications
- NSF/SSO aware HSRP, GLBP
- Fast Link Failure Detection
- Fast Switchover time (<200msec)
- ION with MPLS, IPv6, BFD
- Multicast HA
- Full Image ISSU*

#### Security/Operational Manageability
- Per-int NetFlow, NetFlow top talkers
- CPU traffic monitoring
- Policy Based ACL
- Auto Secure
- Configuration Rollback

#### MPLS/BGP Enhancements
- MPLS Fast Re-route
- MPLS TE Enhancements
- BGP subnet peering

*Planned for Whitney 2.0
## Catalyst 6500 UNIQUE Value Propositions

<table>
<thead>
<tr>
<th>Backbone</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ 2Tbit system roadmap</td>
</tr>
<tr>
<td>▪ 264 10GE ports/system</td>
</tr>
<tr>
<td>▪ Virtual Switching</td>
</tr>
<tr>
<td>▪ Network Virtualization</td>
</tr>
<tr>
<td>▪ Scalable Wireless Integration</td>
</tr>
<tr>
<td>▪ Integrated Security (FWSM, IDSM2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC/High Performance Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Virtual Switching</td>
</tr>
<tr>
<td>▪ 10GE-T (802.3an)</td>
</tr>
<tr>
<td>▪ 1000+ GE Ports/system</td>
</tr>
<tr>
<td>▪ Resource Mgmt (EEM, V-Frame)</td>
</tr>
<tr>
<td>▪ Environmentals (Power, cabling)</td>
</tr>
<tr>
<td>▪ Converged Services (ACE, FWSM)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wiring Closet Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Core/Dist Feature consistency</td>
</tr>
<tr>
<td>▪ Integrated Security</td>
</tr>
<tr>
<td>▪ Application Intelligence</td>
</tr>
<tr>
<td>▪ PoE Scalability &amp; Port Density</td>
</tr>
<tr>
<td>▪ Instrumentation (Netflow, ERSpan, NAM)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EWAN Service Aggregation/Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Virtualized Services</td>
</tr>
<tr>
<td>▪ Application Optimization</td>
</tr>
<tr>
<td>▪ 6524-10GE, self-managed MAN</td>
</tr>
<tr>
<td>▪ Scalable IPSec Solutions</td>
</tr>
<tr>
<td>▪ Routing Leadership (MPLS, IPv6)</td>
</tr>
<tr>
<td>▪ Scalable Service Flexibility</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software Modularity</th>
<th>ISSU</th>
<th>Safe Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>EEM</td>
<td>Call Home</td>
</tr>
<tr>
<td>SNMP</td>
<td>Smart Port</td>
<td>Rollback</td>
</tr>
<tr>
<td>Netflow</td>
<td>NAM</td>
<td>NBAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERSPAN</td>
</tr>
</tbody>
</table>

32 gigabit to 4 Terabits Capacity
Data Center Access Update
Top Business Drivers in Data Center Access
Catalyst 6500’s Strategy

Top Data Center Business Drivers

<table>
<thead>
<tr>
<th>Scalability Flexibility</th>
<th>Business Continuity</th>
<th>Cost Containment</th>
</tr>
</thead>
</table>

Catalyst 6500 Innovations

**Architectural Scalability**
- GE/10GE density
- Virtual Switching
- Virtualized Services
- IP Services Scalability (Multicast etc)

**Non-Stop Communication**
- IOS Modularity, ISSU
- NSF/SSO
- Multicast HA
- GOLD, CPP

**Operational Manageability**
- EEM, Call Home
- VFrame
- Visibility – NAM, ERSPAN, Netflow

Cost Containment
- EEM, Call Home
- VFrame
- Visibility – NAM, ERSPAN, Netflow
Data Center Access
Advantages of Deploying End of Row

Key Benefits
- Feature Consistency
- Common sparing between Data Center devices
- Less Devices to Manage
- Increased fault tolerance
- Simpler Physical & Logical topology

High Density and Ease of Cable Management With
- 96 10/100/1000 mini-RJ21
- 6509-V-E
Assume you just want to add one server to a web-farm...

The challenge is one of ‘coordination delays’. This type of simple scale-out of an existing serve often takes enterprises 90-days.

New service turn-ups, after the application has been developed, often take 180+ days.

VFrame is designed to eliminate these delays and automate the provisioning of services.
VFrame Enterprise Service Provisioning
A Scale-Out Example

VFrame 4.0
Supports Catalyst 6500

Partner Provisioning Applications

VFrame Provisions Routable Subnet
VFrame configures Virtual FW Instance on FWSM
VFrame adds server to SLB Pool
VFrame configures port, VLAN, and switch policy
VFrame net-boots the server to an appropriate LUN/Image
VFrame provisions LUN and WW Naming
VFrame provisions storage volume and boot-image

Q3CY07
Data Center Access
Application Visibility

Per-Interface Netflow
Optimize Netflow Table and Lower CPU utilization:

- Prior to SXH, hardware IPv4 NetFlow creation is global
- With per-interface NetFlow, user explicitly chooses interfaces that will create and export NetFlow entries
  Only interfaces with ip flow ingress will create NetFlow entries

Netflow Top Talkers
Analyze network traffic quickly and easily:

- Security—See if traffic patterns are consistent with a DoS or other undesirable behavior
- Traffic load—Identify heavily used parts of the network so you can redistribute load accordingly
- Traffic analysis—Baseline network traffic for capacity planning and network engineering
Smart Call Home Reduces MTTR in Data Center

Internet

Secure Transport

IOS 12.2(33)SXH

---

Service Request Tracking System

---

Call Home DB

- Customer Notification
- Device and Message Reports
- Exceptions/Fault Analysis

Messages Received:
- Diagnostics
- Environmental
- Syslog
- Inventory and Configuration

---

12.2(33)SXH
Data Center Airflow
Converts Airflow to Front to Back

- Partner Designed for Cisco’s Data Center equipment:
  - Catalyst 6500 and MDS platforms
- Directed/channeled cooling to convert side-side airflow devices to front to back airflow
- Optimized for current and future cooling requirements
- AC or DC options for Power Distribution Units (PDU)
- Cable Management Options
- Dimension
  - 45 RU Vertical Space
  - H (85.5”) x W (31.5”) x D (40.81”)

### Catalyst 6500 UNIQUE Value Propositions

#### Backbone
- 2Tbit system roadmap
- 264 10GE ports/system
- Virtual Switching
- Network Virtualization
- Scalable Wireless Integration
- Integrated Security (FWSM, IDSM2)

#### DC/High Performance Access
- Virtual Switching
- 10GE-T (802.3an)
- 1000+ GE Ports/system
- Resource Mgmt (EEM, V-Frame)
- Environmentals (Power, cabling)
- Converged Services (ACE, FWSM)

#### Wiring Closet Access
- Core/Dist Feature consistency
- Integrated Security
- Application Intelligence
- PoE Scalability & Port Density
- Instrumentation (Netflow, ERSSPAN, NAM)

#### EWAN Service Aggregation/Metro
- Virtualized Services
- Application Optimization
- 6524-10GE, self-managed MAN
- Scalable IPSec Solutions
- Routing Leadership (MPLS, IPv6)
- Scalable Service Flexibility

<table>
<thead>
<tr>
<th>Software Modularity</th>
<th>ISSU</th>
<th>Safe Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>EEM</td>
<td>Call Home</td>
</tr>
<tr>
<td>SNMP</td>
<td>Smart Port</td>
<td>Rollback</td>
</tr>
<tr>
<td>Netflow</td>
<td>NAM</td>
<td>NBAR</td>
</tr>
</tbody>
</table>

#### 32 gigabit to 4 Terabits Capacity
Wiring Closet Access Update
### Why Select the Catalyst 6500 Series in the Wiring Closet?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower OPEX</td>
<td>OS consistency and common hardware sparing Across LAN, WAN and Data Center</td>
</tr>
<tr>
<td>PoE Scalability &amp; Port Density</td>
<td>Industry leading PoE Scalability, PoE upgradeability, Highly efficient power (&gt; 85% )</td>
</tr>
<tr>
<td>Integrated Security</td>
<td>Comprehensive Security, embedded HW deep packet inspection</td>
</tr>
<tr>
<td>Application Intelligence</td>
<td>High performance stateful application intelligence</td>
</tr>
<tr>
<td>Network Resiliency</td>
<td>Hardware redundancy, IOS modularity, NSF/SSO EEM, GOLD</td>
</tr>
<tr>
<td>Superior Instrumentation</td>
<td>Hardware-based Netflow and ERSPAN</td>
</tr>
<tr>
<td>Investment Protection</td>
<td>Modular architecture, easy migration from Cat5K with CatOS to IOS migration tool</td>
</tr>
</tbody>
</table>
Catalyst 6500 Wiring Closet System Offerings

- Rich wiring closet base offering and service upsell options
- Lower TCO with modular architecture, price per port drops over the years
- OS consistency, Software Modularity and Safe Harbor

144 Port 10/100/1000 System with 10GE uplinks

Base Offering
- 15Mpps
- CIST, IBNS, NAC, CoPP
- IOS Modularity
- NSF/SSO, GOLD, EEM
- HW Netflow, ERSPAN

Premium Services with PoE
- Application Intelligence
- Embedded security
- MultiGigabit
- NBAR & FPM

PoE

ASP Per Port

Services

- $232
- $206
- $199
- $173

Pricing:
- 144 Port 10/100/1000 System with 10GE uplinks
  - $232
  - $206
  - $199
  - $173
Today’s Enterprise Network: Application and Security

Application
- Increasing number of users and bandwidth-intensive applications
- Converged network services: Data, Voice and Video
- Recreational traffic consuming more bandwidth
- Server consolidation & application outsourcing: More applications across WAN or Internet

Security
- Rapid proliferation of security threats: worms, viruses
- Disappearing security boundaries
- Security threats originating from inside
- Security threat deep in the content carried inside normal application traffic such as HTTP, E-mail
Supervisor Engine 32 PISA Delivers Intelligence In Wiring Closets

- **NBAR**
  - Application awareness and intelligent classification
  - Multigigabit Performance

- **Flexible Packet Matching**
  - Rapid Security Protection
  - Multigigabit Performance

- **Programmable architecture**
  - Seamless new service adoption

- **Full Integration with**
  - IPv4 & IPv6 in hardware
  - Advanced multicast & MPLS
  - Enhanced Manageability
  - HA with NSF/SSO and more
**Catalyst 6500**

**PISA**

- Crypto Engine
- Route Processor DRAM (1GB)
- FPGA
- Route Processor
- Network Processor SRAM (32MB)
- Network Processor DRAM (768MB)
- Network Processor

---

Deep and Stateful Packet Inspection -- Integrated MSFC for FULL Layer 3 Functionality -- Faster Route Processor CPU for improvements in Netflow Export, Layer 3 protocol convergence and NAC -- Performance @ 2Gbps

---

**Programmable Intelligent Services Accelerator**
## Supervisor Engine 32 PISA
### Product FAQ

### Hardware
- WS-S32-GE-PISA  $28,000 Target FCS May, CY07
- WS-S32-10GE-PISA  $28,000 Target FCS, June CY 07
- 1GB RP DRAM, 512M SP DRAM

### Linecard Support
- Classic/CEF 256 Based LAN Linecards
- WAN - Enhanced FlexWAN, SIP-200, SIP-400
- Service Module – FWSM, VPN SPA, NAM

### Software
- 12.2(18)ZY (Rockies3 based) – ION Support 1H08
- NBAR & FPM included in IP BASE LAN image
- Additional $10,000 IP Services license
- CB-QoS MIB, Protocol Discovery MIB

### Services
- Foundation for Advanced Closet Services based on L3
- Advanced Deep Packet Inspection (NBAR, FPM)
- Full L3 Functionality

### Reference:
PISA Management Model

- Pre-defined FPM filters on CCO work in progress

QoS Policy Manager

- Centralized QoS Management
  - NBAR Provisioning
  - NBAR Monitoring

Cisco Security Manager

- Enable Management of Integrated Security
  - FPM Policy Management with FlexConfig Option

CS-MARS

Monitoring/Analysis/Mitigation

FW/IPS/VPN Policy

FPM Policy

Catalyst 6500 IPS module

IPS 4200 Series

ASA 5500 AIP-SSM

Router

Router IPS in Software

PISA

Central Management Device

NBAR Policy

NBAR Provisioning

NBAR Monitoring

Cisco Security Manager Enable Management of Integrated Security • FPM Policy Management with FlexConfig Option

Presentation_ID © 2006 Cisco Systems, Inc. All rights reserved. Cisco Confidential 54
**Protocol Discovery**: discover what apps are running on your network and provide real-time statistics

- Per-interface, per-protocol, bi-directional statistics
  - bit rate (bps); packet count; byte count
- SNMP accessible for centralized monitoring
- **Supported by Partner products** (Concord|CA, InfoVista, Micromuse|IBM) and MRTG
Sup32 PISA Flexible Packet Matching

Network managers require tools to filter Day Zero.1 attacks (e.g. prior to IPS signatures being available).

Traditional ACLs take a shotgun approach – legitimate traffic could be blocked.

FPM delivers flexible, granular Layer 2-7 matching.

Useful for CERT-like teams within Service Providers and Enterprise customers.

Flexible Classification and Rapid Response

- Goes beyond static attributes – specify arbitrary bits/bytes at any offset within the payload or header
- Classify on multiple attributes within a packet
- String match and regex
- Set up custom filters rapidly using XML-based policy language

Cisco.com/go/fpm
Sup 32 PISA Deployment Scenario
Enterprise WAN/MAN

Remote/Regional Office

- ATM or Frame Relay
- Lease Line MLPPP
- IP/MPLS
- IPSec
- Metro Ethernet Service

Internet

Comprehensive Services

Catalyst 6500
Catalyst 6500 with PISA
"Appliance Solution"

Head Quarter

CAMPUS NETWORK

FWSM
IDSM
IPSec

My application is too slow!

Sup 32 PISA Deployment Scenario
Enterprise WAN/MAN

Mark packets on ingress based on application priority (PISA), police traffic on egress and perform egress queuing/shaping on the egress WAN linecard.

<table>
<thead>
<tr>
<th>Application</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citrix</td>
<td>25%</td>
</tr>
<tr>
<td>Netshow</td>
<td>15%</td>
</tr>
<tr>
<td>Fasttrack</td>
<td>10%</td>
</tr>
<tr>
<td>FTP</td>
<td>30%</td>
</tr>
<tr>
<td>HTTP</td>
<td>20%</td>
</tr>
</tbody>
</table>
Sup 32 PISA Deployment Scenario
Campus Access Layer

- Mark Business-critical applications real-time as GOLD service
- Police non-priority applications

- Block worms like Slammer using Flexible Packet Matching
- Detect and Rate-limit undesired Peer to Peer Traffic

My application is too slow!

Link Utilization

- Citrix 25%
- Netshow 15%
- Oracle 10%
- FTP 30%
- HTTP 20%

Printer

PCs

My application is too slow!
High Density Power Over Ethernet
Cisco Catalyst 6500 8700 W AC Power Supply

<table>
<thead>
<tr>
<th># of Inputs</th>
<th>Type of Input</th>
<th>Output Power</th>
<th>Class 3 802.3af Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>110V</td>
<td>-</td>
<td>130</td>
</tr>
<tr>
<td>2</td>
<td>110V</td>
<td>2800W</td>
<td>195</td>
</tr>
<tr>
<td>3</td>
<td>110V</td>
<td>4200W</td>
<td>285</td>
</tr>
<tr>
<td>1</td>
<td>220V</td>
<td>2800W</td>
<td>130</td>
</tr>
<tr>
<td>2</td>
<td>220V</td>
<td>5800W</td>
<td>285</td>
</tr>
<tr>
<td>3</td>
<td>220V</td>
<td>8700W</td>
<td>420</td>
</tr>
</tbody>
</table>

Limited Orderability – April 16th, FCS – April 23rd

Remotely Shutdown or Power Cycle Catalyst 6500 without access to CLI via Relay Controller

Cisco Tested Relay Controller – iB6500 from Data Probe
http://www.dataprobe.com/products/control/ib6500.html
Catalyst 6500
802.3af PoE Enhancements

<table>
<thead>
<tr>
<th>Feature</th>
<th>WS-F6K-GE48-AF</th>
<th>WS-F6K-48-AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW Allocation maximum power per port</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Limit maximum power per port in HW</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Over current protection on per port basis</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Per port Current measurement</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Measure real-time usage at a port level</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

New Daughter Card:

• **Product ID – WS-F6K-48-AF**
• **Field upgradeable**
• **SW transparent for legacy features**
• **Requires CatOS 8.5 and IOS Whitney for new features**
Catalyst 6500 Wiring Closet Software Services
Key Areas of Investment

Integrated Security
- CIST, CoPP
- IBNS, NAC (L2 IP, L2.1x, L3)
- Embedded HW security for worm mitigation
- PACL, AutoSecure
- CTS, TIDP

Non-stop Communication/Unified Network Services
- NSF/SSO
- GOLD
- IOS Modularity
- PoE upgradeability
- GLBP/HSRP NSF/SSO
- FHRP EOT

Operational Manageability
- OS consistency
- ERSPAN
- EEM, Call Home, Cfg Rollback
- Per-int Netflow, Netflow Top N
- LLDP, LLDP-MED, Location Service
- Smartport, AutoQoS ...

Application Intelligence
- PISA HW NBAR with
  Real-time App Visibility
  Stateful application intelligence

Catalyst 6500 Foundation of CCF

Black – shipping  White- Whitney1/PISA  Blue - roadmap
AutoSecure
One Touch Automated Switch Lockdown

**Disables Non-Essential Services**
- Eliminates DoS attacks based on fake requests
- Disables mechanisms that could be used to exploit security holes

**Enforces Secure Access**
- Enforces enhanced security in accessing device
- Enhanced security logs
- Prevents attackers from knowing packets have been dropped

**Secures Control Plane**
- Enables RP rate-limiters to protect control plane
### Catalyst 6500 Key IBNS Features Support Matrix

#### Note:
Whitney 2 feature info. subject to change

<table>
<thead>
<tr>
<th>Feature</th>
<th>CatOS 8.6</th>
<th>Whitney 1</th>
<th>Whitney 2 (Pending EC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic authentication</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>VLAN assignment</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PIVLAN assignment</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Guest VLAN</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Auth-Failed VLAN</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Private Guest VLAN</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ACL/Downloadable ACL</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>QoS</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>HA</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Radius accounting</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Radius supplied session timeout</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Inaccessible Auth Bypass (IAB)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Identity-to-port description mapping</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>802.1x with DHCP snooping</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Interop w/ port security</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Multi-host</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Multi-auth</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>VID</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Wake on LAN (W/OL)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Multi-Domain/Auth/third-party phone</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>NAC L2 802.1x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>NAC L2 802.1x URL redirect</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>MIBs</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Basic auth</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Downloadable ACL</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>URL redirect</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>QoS policy</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>MAB aging session timer</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>MAB aging &amp; device removal for IPT</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Definable Security Violation Actions for MAB and IPT</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>MAC Auth Bypass IAB</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Basic auth</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Downloadable ACL</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>URL redirect</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Web auth</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>IAB</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Flex auth with fixed order (1x-&gt;MAB-&gt;Webauth)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
# Catalyst 6500 Operational Manageability Leadership

## Whitney 1 Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Call Home**            | • Proactive diagnostics with GOLD  
                            • Proactive troubleshooting  
                            • Automatic notification of Cisco TAC to reduce MTTR  
                            • Reduce OPEX |
| **LLDP/LLDP-MED**        | • LLDP-MED Supports third-party IP phone with auto discovery:  
                            VLAN, Power exchange etc  
                            • Location Services with LLDP and CDP* |
| **NetFlow Enhancement**  | • Per-interface netflow: optimize netflow table and lower CPU utilization  
                            • Netflow Top talker: Identify network traffic quickly and easily |
| **Smart Port AutoQoS**   | • Easy configuration process  
                            • Easy QoS provisioning and management |
| **Config Rollback**      | • Enables return to known configuration states and reduces MTTR  
                            • Minimizes human errors impact. Even seasoned professionals ‘fat fingers’  
                            • Allows recovery, prevents escalation and exacerbation  
                            • Ability to checkpoint up to 5 configurations on the bootflash or flash disk |

* Whitney 2 Roadmap
CatOS to IOS Migration Resources

- **NEW REVISED** CatOS to IOS configuration tool
  - Now Available on CCO for free customer download!
  - CatOS & IOS comparison document
  - CatOS to IOS conversion document

- CatOS to IOS feature parity
  - Two focus areas: Security (IBNS) and manageability (Netflow, SmartPort, AutoQoS etc)
  - Whitney 1 achieves significant parity and Whitney 2 reaches max parity
CatOS to IOS Migration – Configuration Conversion Tool

```
31 set boot system flash bootflash:/cat6500-so-mpltz.7-6-6.bin
32 set mls mke flow exclude destination 1.2.3.4/255.255.255.255 protocol 23 dst-port 12
33 set qos wred l3p2t1 tx queue 1 0:2 0:3
34 set qos wred l3p3t1 tx queue 1 0:2
35 set qos policed-dscp-map 0:0
36 set qos policed-dscp-map 1:2
37
39 set vtp domain edi
40 set vtp node transparent
41 set vtp v2 disable
42 set vtp pruned ineligible 2-1020
43 clear vtp pruned ineligible 1021-1055
44
45 ! CSCd04276
46 set tacacs server 1.1.1.1
47 clear ip dns server 1.1.1.1
48
49 ! CSCd04266
50 set port duplex 3/10 full
51
52 ! CSCd04283
53 set mmp community read-only
54 set mmp community read-write
55 set mmp community read-write-all
56
57 ! CSCd04273
58 set interface sc0 101
59
60 ! CSCd04289
61 set system contact cisco_contact xxx
62 set system location cisco_location
63 set system name cisco_name
64
65 ! CSCd04210
66 ! This port has no #module line
67 set port enable 3/10
68
69
```

Translation Target Selection

Select which OS version it shall be translated to

Available Versions: Cat6500-12.2(16)SXF

[OK] [Cancel]
## Catalyst 6500 Operations Management - CatOS Conversion

<table>
<thead>
<tr>
<th>Original 8.5(1) Commands</th>
<th>Translated 12.2(18)SXF Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>#module 1: 2-port 1000BaseX Supervisor</td>
<td>#module 1: 2-port 1000BaseX Supervisor</td>
</tr>
<tr>
<td>#module 2 empty</td>
<td>#module 2 empty</td>
</tr>
<tr>
<td>#module 3: 48-port 10/100BaseTX Ethernet</td>
<td>#module 3: 48-port 10/100BaseTX Ethernet</td>
</tr>
<tr>
<td>#module 4: 6-port Gigabit Ethernet WAN</td>
<td>#module 4: 6-port Gigabit Ethernet WAN</td>
</tr>
<tr>
<td>#module 5 empty</td>
<td>#module 5 empty</td>
</tr>
<tr>
<td>#module 6 empty</td>
<td>#module 6 empty</td>
</tr>
<tr>
<td>#module 15: 1-port Multilayer Switch Feature Card</td>
<td>#module 15: 1-port Multilayer Switch Feature Card</td>
</tr>
<tr>
<td>#module 16 empty</td>
<td>#module 16 empty</td>
</tr>
<tr>
<td>set vtp mode client</td>
<td>vtp mode client</td>
</tr>
<tr>
<td>set vtp mode off</td>
<td>no vtp mode</td>
</tr>
<tr>
<td>set vtp domain test mode client</td>
<td>! Parser Error: Unknown Command</td>
</tr>
<tr>
<td>set vtp domain test2 v2 disable</td>
<td>! Parser Error: Unknown Command</td>
</tr>
<tr>
<td>set port enable 3/10</td>
<td>interface FastEthernet3/10</td>
</tr>
<tr>
<td>set port channel 3/1-8 mode desirable</td>
<td>no shutdown</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/1</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/2</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/3</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/4</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/5</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/6</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/7</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>interface FastEthernet3/8</td>
</tr>
<tr>
<td>channel-group ?some-channel-number? mode desirable</td>
<td>channel-group ?some-channel-number? mode desirable</td>
</tr>
<tr>
<td>set cdp disable</td>
<td>no cdp</td>
</tr>
<tr>
<td>set cdp enable 3/10</td>
<td>cdp run</td>
</tr>
<tr>
<td>set cdp enable</td>
<td>interface FastEthernet3/10</td>
</tr>
<tr>
<td>set cdp version v2</td>
<td>cdp enable</td>
</tr>
<tr>
<td></td>
<td>cdp advertise-v2</td>
</tr>
</tbody>
</table>
Catalyst 6500
Operations Management - Platform Capacity

At a glance viewing of the current use of switch resources provides operators with the ability to determine if any actions need to be taken to maintain the operation state of the switch...

**SHOW PLATFORM HARDWARE CAPACITY COMMAND**

```
6500#show platform hardware capacity ?
   acl       Show QoS/Security ACL capacity
   cpu       Show CPU resources capacity
   eobc      Show EOB resources capacity
   fabric    Show Switch Fabric resources capacity
   flash     Show Flash/NVRAM resources capacity
   forwarding Show forwarding engine capacity
   interface Show Interface resources capacity
   monitor   Show SPAN resources capacity
   multicast Show L3 Multicast resources capacity
   netflow   Show Netflow capacity
   pfc       Show PFC resources capacity
   power     Show Power resources capacity
   qos        Show QoS resources capacity
   rate-limit Show CPU Rate Limiters capacity
   system    Show System resources capacity
   vlan      Show VLAN resources capacity

<cr>
```

```
6500#show platform hardware capacity
System Resources
   DPC operating mode: DPC3B
   Supervisor redundancy mode: administratively sso, operationally sso

Switching resources: Module  Part number  Series  CEF mode
   2  WS-SVC-FWM-1       CEF256  CEF
   4  WS-X6516-GE-TX     CEF256  CEF
   5  WS-SVC-NAM-2       CEF256  CEF
   6  WS-SUF720-Base     supervisor  CEF

Power Resources
   Power supply redundancy mode: administratively redundant
   operationally redundant
   System power: 1153W, 0W (0%) inline, 681W (76%) total allocated
   Powered devices: 0 total, 0 Class3, 0 Class2, 0 Class1, 0 Class0, 0 Cisco

Flash/NVRAM Resources
   Usage: Module Device  Bytes:  Total  Used  %Used
   6  SF disk0:         128626688 8470184 66%
   6  SF sup-bootflash: 65536000  0  0%
   6  SF const_nvr:     125004  1844 1%
   6  SF nvr:           15640216 449618 23%
   6  SF bootflash:     69536000 2680608 4%

--More--
```
Catalyst 6500
Operations Management - Configuration Check

The Catalyst 6500 provides a command that analyses the running configuration for configuration inaccuracies and highlights these in the command output - provides a means to optimize the configuration...

Router# show diagnostic sanity
Ping default gateway 172.26.197.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.26.197.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms

Could not verify boot image "disk0:s72033-js-mz.capacity" specified in the boot string.

UDLD has been disabled globally - port-level UDLD sanity checks are being bypassed.

The value for Community-Access on read-only operations for SNMP is the same as default. Please verify that this is the best value from a security point of view.

The value for Community-Access on write-only operations for SNMP is the same as default. Please verify that this is the best value from a security point of view.

System Config checks include:
- SNMP Community Strings
- Trunk Interfaces
- Port Channeling
- Spanning Tree Configuration
- POST Results
- UDLD Enabled
- Port Level Flow Control
- Portfast on Host Ports
- Module Status
- Default Gateway Reachable
- HA Properly Enabled
- Valid Boot String
- IGMP Snooping Enabled
- Inline Power Ports
- Port Duplex Mismatch
Catalyst 6500 UNIQUE Value Propositions

<table>
<thead>
<tr>
<th>Backbone</th>
<th>DC/High Performance Access</th>
<th>Wiring Closet Access</th>
<th>EWAN Service Aggregation/Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Tbit system roadmap</td>
<td>Virtual Switching</td>
<td>Core/Dist Feature consistency</td>
<td>virtualized Services</td>
</tr>
<tr>
<td>264 10GE ports/system</td>
<td>10GE-T (802.3an)</td>
<td>Integrated Security</td>
<td>Application Optimization</td>
</tr>
<tr>
<td>Virtual Switching</td>
<td>1000+ GE Ports/system</td>
<td>Application Intelligence</td>
<td>6524-10GE, self-managed MAN</td>
</tr>
<tr>
<td>Network Virtualization</td>
<td>Resource Mgmt (EEM, V-Frame)</td>
<td>PoE Scalability &amp; Port Density</td>
<td>Scalable IPSec Solutions</td>
</tr>
<tr>
<td>Scalable Wireless Integration</td>
<td>Environments (Power, cabling)</td>
<td>instrumentation (Netflow,ERSPAN, NAM)</td>
<td>Routing Leadership (MPLS, IPv6)</td>
</tr>
<tr>
<td>Integrated Security</td>
<td>Converged Services (ACE, FWSM)</td>
<td></td>
<td>Scalable Service Flexibility</td>
</tr>
<tr>
<td>(FWSM, IDSM2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

32 gigabit to 4 Terabits Capacity

<table>
<thead>
<tr>
<th>Software Modularity</th>
<th>ISSU</th>
<th>Safe Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>EEM</td>
<td>Call Home</td>
</tr>
<tr>
<td>SNMP</td>
<td>Smart Port</td>
<td>Rollback</td>
</tr>
<tr>
<td>Netflow</td>
<td>NAM</td>
<td>NBAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERSPAN</td>
</tr>
</tbody>
</table>
Cisco IOS Software Modularity on the Catalyst 6500

**INNOVATION**

Cisco IOS Software Modularity

- High Availability Infrastructure
- Network Optimized Microkernel
- Catalyst 6500 Data Plane

- Memory protection
- Fault containment
- Stateful process restarts
- Subsystem ISSU

**BENEFITS**

Catalyst 6500 Series with Cisco IOS Software Modularity

- Minimize Unplanned Downtime
- Simplify Software Changes
- Automated Policy Control
Cisco IOS Software Modularity
NOW ON CCO!

Modular Processes
• Include the following at FCS:
  • Routing Process
  • Internet Daemon
  • Raw IP Processing
  • TCP Process
  • UDP Process
  • CDP Process
  • Syslog Daemon
  • All Embedded Event Manager components
• File Systems
• Media Drivers
• Install Manager

Support
• Ability to patch individual Cisco IOS process
• Patches for publicly announced security vulnerabilities (PSIRT)
• CCO-based tooling to support management of patches
• Some features unavailable at FCS but being planned for next phase (notable ones are MPLS, IPv6, and BFD)
If an error occurs in a modular process…

- HA subsystem determines the best recovery action
  - Restart a modular process
  - Switchover to standby Supervisor
  - Remove the system from the network

- Process restarts with no impact on the data plane
  - Utilizes Cisco Nonstop Forwarding (NSF) where appropriate
  - State Checkpointing allows quick process recovery
Embedded Event Manager
Detailed Architecture

Events
- SNMP Agent
- IOS IDB's
- IOS CLI
- VRF
- OR
- SYSLOG
- HA
- Routing Counters
- Memory

Catalyst 6500 Event Detectors
- SNMP Event Detector
- Timer Event Detector
- Counter Event Detector
- IF Counter Event Detector
- CLI Event Detector
- QoS Event Detector
- Non-Event Detector
- RF Event Detector
- IOS Switching Event Detector
- Application Event Detector
- SYS Manager Event Detector
- SYS Monitor Event Detector

Embedded Event Manager Server
- EEM Event Detector API
- EEM Event Client API

- CLI Based (Applet)
- Script Based (TCL)

EEM Policy Director
- Subscribes to event and implements actions

Actions
- Execute CLI Command
- Force an SSO Switchover
- Send an email
- Reload the Switch SW
- Generate SNMP Trap
- Etc.
Cisco Beyond - A Scripting Community for Embedded Event Manager

- Cisco IOS EEM
  - Extremely flexible and powerful onboard, event driven, scripting facility

- Cisco Beyond
  - A place to share scripts, upload, download, get examples

- Coming to CCO in Nov 2006

Catalyst 6500 IOS Release Strategy for 12.2SX

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q1</td>
</tr>
<tr>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
</tr>
<tr>
<td>Q3</td>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>Q4</td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
</tbody>
</table>

- **Standard Maintenance (SM) Release**
- **Extended Maintenance (EM) Release**
- **PSIRT fixes only**
- **Sev1 and 2 Operationally Impacting Bug (OIB) fixes for 12 months**
- **Regular Maintenance Rebuilds for 24 months with fixes for Sev1/2/3 Operationally Impacting Bug (OIB) fixes**
- **12 month period to qualify and deploy new EM Release**

**Legend**
- **Extended Maintenance (EM) Release**
- **Standard Maintenance (SM) Release**
- **Safe Harbor Tested**
- **SH**
Catalyst 6500 IOS Release Strategy for 12.2SX – Plans for Next Few Releases

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend
- **Extended Maintenance (EM) Release**
- **Standard Maintenance (SM) Release**
- **Safe Harbor Tested**

Catalyst 6500
Whitney

Whitney IOS Release
200+ New Features

New HW Feature List

- Sup720-10GE-3C
- Sup720-10GE-3CXL
- DFC3C
- DFC3CXL
- 8700W PSU
- SIP-200 w/Software Modularity
- SIP-400 w/Software Modularity
- 1 x OC48 POS SPA
- 4 x FE SPA
- 8 x FE SPA

New SW Feature List

- ION MPLS
- 16 Way ECMP
- Port ACL's (PACL)
- 802.1x CatOS Feature Parity
- Inaccessible Auth Bypass
- Web Auth w/Downloadable ACL
- Web Auth w/HTTPS
- HTTPS
- Layer 2 NAC w/802.1x
- Layer 3 NAC
- Netflow Based Anomaly Detection
- Web Auth w/SSO
- Customizable Smartports
- Netflow Top Talkers
- Auto-QoS
- Call Home with EEM and GOLD
- LLDP and LLDP-MED
- Input Pkts on Dest SPAN Port
- MAC Address Notification

- IP Source Guard
- ION IPv6
- ION BFD
- Enhanced Object Tracking
- NAC SSO Support
- Virtual Switch
- Virtual Switch HA
- Multi-Chassis Etherchannel
- GOLD support for VS
- FHRP
- IGMP Filtering
- MPLS Static Labels
- 14 TX SPAN Sessions
- Configuration Rollback
- Policy Based ACL
- MPLS TE w/SSO Features
- Per VRF BGP Router-ID
EWAN Update
Catalyst 6500
The 6500 and 7600 Split

Cisco 7600 Series

Supported on 7600 Platform

Supported on 7600 Platform

Supported on 7600 Platform with Caveats

Supported on 7600 Platform with Caveats

7600 Software Releases

12.2(33)SRA (Cascades)

12.2(33)SRB (Barracuda)

12.2(33)SXH (Whitney 1)

12.2(33)SXI (Whitney 2)

6500 Software Releases

Supported on 6500 Platform

Supported on 6500 Platform with Caveats

Supported on 6500 Platform

Supported on 6500 Platform
Catalyst 6500 – 12.2SX Statement of Direction

Maximize Investment and Feature Velocity for Enterprise and Metro Ethernet Segments

- **SW and HW consistency** in the Enterprise network for simplified operations
- IOS Software Modularity for **maximum uptime**
- Leadership in **secured WAN VPN solutions** (IPSec, DMVPN, GETVPN, L2TPv3…)
- **MPLS and VPLS** WAN solutions (EARL8 committed with H-VPLS in HW)
- **WAN links optimization** with PISA, OER
- **Safe Harbor and FTL** extended to eWAN for End-to-End solution validation
- **Application Intelligence** and **Flexible Packet Matching** at OC48 speeds
## Catalyst 6500 UNIQUE Value Propositions

### Key Takeaways

<table>
<thead>
<tr>
<th>Backbone</th>
<th>DC/High Performance Access</th>
<th>Wiring Closet Access</th>
<th>EWAN Service Aggregation/Metro</th>
</tr>
</thead>
</table>
| - 2Tbit system roadmap  
- 264 10GE ports/system  
- Virtual Switching  
- Network Virtualization  
- Scalable Wireless Integration  
- Integrated Security (FWSM, IDSM2) | - Virtual Switching  
- 10GE-T (802.3an)  
- 1000+ GE Ports/system  
- Resource Mgmt (EEM, V-Frame)  
- Environmentals (Power, cabling)  
- Converged Services (ACE, FWSM) | - Core/Dist Feature consistency  
- Integrated Security  
- Application Intelligence  
- PoE Scalability & Port Density  
- Instrumentation (Netflow, ERSSPAN, NAM) | - virtualized Services  
- Application Optimization  
- 6524-10GE, self-managed MAN  
- Scalable IPSec Solutions  
- Routing Leadership (MPLS, IPv6)  
- Scalable Service Flexibility |

### Software Modularity

<table>
<thead>
<tr>
<th>Software Modularity</th>
<th>ISSU</th>
<th>Safe Harbor</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>EEM</td>
<td>Call Home</td>
</tr>
<tr>
<td>SNMP</td>
<td>Smart Port</td>
<td>Rollback</td>
</tr>
<tr>
<td>Netflow</td>
<td>NAM</td>
<td>NBAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERSPAN</td>
</tr>
</tbody>
</table>

### 32 gigabit to 4 Terabits Capacity
Catalyst LAN Switching

Product Overview

Catalyst Standalone and Stackable solutions
Catalyst Switching Portfolio

Features, Scalability, Longevity

Distribution/Core
- Catalyst 4500
- Catalyst 6500

Datacenter Access
- Catalyst 4948
- Catalyst 6500

Wiring Closet
- Blade Switches
- Catalyst 29xx
- Catalyst 3560
- Catalyst 3750
- Catalyst 4500
- Catalyst 6500

Number of Employees/Density
- Small
- Medium-sized
- Large
## Cisco Catalyst 2960 Series Model Overview

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco Catalyst 2960G-24TC</strong></td>
<td>24 10/100 ports, 2 dual-purpose uplink ports</td>
</tr>
<tr>
<td><strong>Cisco Catalyst 2960G-48TC</strong></td>
<td>44 10/100/1000 ports, 4 dual-purpose uplink ports</td>
</tr>
<tr>
<td><strong>Cisco Catalyst 2960-24TC</strong></td>
<td>24 10/100 ports, 2 dual-purpose uplink ports</td>
</tr>
<tr>
<td><strong>Cisco Catalyst 2960-48TC</strong></td>
<td>48 10/100 ports, 2 dual-purpose uplink ports</td>
</tr>
<tr>
<td><strong>Cisco Catalyst 2960-24TT</strong></td>
<td>24 10/100 ports, 2 10/100/1000 uplink ports</td>
</tr>
<tr>
<td><strong>Cisco Catalyst 2960-48TT</strong></td>
<td>48 10/100 ports, 2 10/100/1000 uplink ports</td>
</tr>
</tbody>
</table>

### Software
- **LAN Base Image**
  - Enterprise-class intelligent services:
    - Advanced QoS, enhanced security, high availability

### Uplinks
- **Dual-Purpose Uplinks**
  - One 10/100/1000BASE-TX port and one SFP port
  - One port active at a time
# Cisco Catalyst 3560 Series Model Overview

## Fast Ethernet Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Ports</th>
<th>SFP Ports</th>
<th>PoE Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalyst 3560-24TS</td>
<td>24 10/100 ports</td>
<td>2</td>
<td>370W IEEE 802.3af / Cisco prestandard PoE</td>
</tr>
<tr>
<td>Catalyst 3560-48TS</td>
<td>48 10/100 ports</td>
<td>4</td>
<td>370W IEEE 802.3af / Cisco prestandard PoE</td>
</tr>
<tr>
<td>Catalyst 3560G-24PS</td>
<td>24 10/100 ports</td>
<td>2</td>
<td>24 10/100 ports</td>
</tr>
<tr>
<td>Catalyst 3560G-48PS</td>
<td>48 10/100/1000 ports</td>
<td>4</td>
<td>48 10/100/1000 ports</td>
</tr>
</tbody>
</table>

## Two Software Versions

- **Standard Multilayer Software Image (SMI)**
  - Enterprise-class intelligent services: Advanced QoS, enhanced security, high availability, static and Routing Information Protocol (RIP) IP routing

- **Enhanced Multilayer Software Image (EMI)**
  - SMI feature set plus: Advanced hardware-based IP unicast and multicast routing, and policy-based routing (PBR)
  - Orderable with either software image
  - Upgrade license available
Cisco Catalyst 3560 Series Model Overview
Gigabit Ethernet Models

Catalyst 3560G-24TS
- 24 10/100/1000 ports
- 4 SFP ports

Catalyst 3560G-48TS
- 48 10/100/1000 ports
- 4 SFP ports

Two Software Versions
- Standard Multilayer Software Image (SMI)
  Enterprise-class intelligent services: Advanced QoS, enhanced security, high availability, static and Routing Information Protocol (RIP) IP routing
- Enhanced Multilayer Software Image (EMI)
  SMI feature set plus: Advanced hardware-based IP unicast and multicast routing, and policy-based routing (PBR)

Catalyst 3560G-24PS
- 24 10/100/1000 ports
- 4 SFP ports
- 370W IEEE 802.3af / Cisco prestandard PoE

Catalyst 3560G-48PS
- 48 10/100/1000 ports
- 4 SFP ports
- 370W IEEE 802.3af / Cisco prestandard PoE

Orderable with either software image
Upgrade license available
## Cisco Catalyst 3750 Series Model Overview

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Catalyst 3750-24TS</strong></td>
<td>• 24 10/100 + 2 SFP ports</td>
</tr>
<tr>
<td><strong>Catalyst 3750-48TS</strong></td>
<td>• 48 10/100 + 4 SFP ports</td>
</tr>
<tr>
<td><strong>Catalyst 3750-24PS</strong></td>
<td>• 24 10/100 + 2 SFP ports</td>
</tr>
<tr>
<td></td>
<td>• 370W PoE</td>
</tr>
<tr>
<td><strong>Catalyst 3750-48PS</strong></td>
<td>• 48 10/100 + 4 SFP ports</td>
</tr>
<tr>
<td></td>
<td>• 370W PoE</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-24TS-1U</strong></td>
<td>• 24 10/100/1000 + 4 SFP</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-48TS</strong></td>
<td>• 48 10/100/1000 + 4 SFP</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-24PS</strong></td>
<td>• 24 10/100/1000 + 4 SFP</td>
</tr>
<tr>
<td></td>
<td>• 370W PoE</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-48PS</strong></td>
<td>• 48 10/100/1000 + 4 SFP</td>
</tr>
<tr>
<td><strong>Catalyst 3750-24FS</strong></td>
<td>• 24 10/100/1000</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-24TS</strong></td>
<td>• 12 SFP (AC or DC)</td>
</tr>
<tr>
<td><strong>Catalyst 3750G-48TS</strong></td>
<td>• 16 10/100/1000</td>
</tr>
<tr>
<td></td>
<td>• 1x 10GE XENPAK</td>
</tr>
<tr>
<td><strong>Catalyst 3750-24PS</strong></td>
<td>• 24 10/100/1000</td>
</tr>
</tbody>
</table>
Catalyst 3560 and 2960 Compact Switches
### Catalyst 3560 and 2960 Compact Switches

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Family</th>
<th>Access Ports</th>
<th>Uplink Port</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS-C3560-8PC-S</td>
<td>Catalyst 3560</td>
<td>8 10/100 PoE</td>
<td>1 10/100/1000 or SFP</td>
<td>$1,395</td>
</tr>
<tr>
<td>WS-C2960-8TC-L</td>
<td>Catalyst 2960</td>
<td>8 10/100</td>
<td>1 10/100/1000 or SFP</td>
<td>$895</td>
</tr>
<tr>
<td>WS-C2960G-8TC-L</td>
<td>Catalyst 2960</td>
<td>7 10/100/1000</td>
<td>1 10/100/1000 or SFP</td>
<td>$1,395</td>
</tr>
</tbody>
</table>

- Enable advanced technology at the network edge for deployments outside the wiring closet.
  
    Office workspaces, micro branch offices, classrooms, cruise ships, and other wiring constrained environments

**Begin shipping in January 2007**

**NDA Information**
Catalyst 3560 and 2960 Compact Switch Overview

- **Compact Form Factor**
  Durable, silent, and versatile design with a metal shell, no fan, small size, magnet, cable guard, and rack mount.

- **Advanced Security**
  Network Admission Control, Enhanced 802.1x, Access Control Lists, DHCP Snooping, Dynamic ARP Inspection and IP Source Guard

- **Support Advanced Technology**
  Power over Ethernet (15.4W on all 8 ports) with superior QoS to support Cisco Unified Communications and Gigabit Ethernet for higher performance

- **Simplified Management**
  Cisco Network Assistant, Catalyst Device Manager, Smartports, and Cisco Works support

- **Investment Protection and Deployment Flexibility**
  Dual-purpose 10/100/1000Base-T and SFP uplink with multiple SFP options. IPv6 support in hardware. Limited Lifetime Warranty.
## Supported Small Form-Factor Pluggable Modules

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLC-FE-100FX</td>
<td>100BASE-FX</td>
</tr>
<tr>
<td>GLC-FE-100LX</td>
<td>100BASE-LX</td>
</tr>
<tr>
<td>GLC-FE-100BX-U</td>
<td>100BASE-BX-U</td>
</tr>
<tr>
<td>GLC-FE-100BX-D</td>
<td>100BASE-BX-D</td>
</tr>
<tr>
<td>GLC-SX-MM</td>
<td>1000BASE-SX</td>
</tr>
<tr>
<td>GLC-LH-SM</td>
<td>1000BASE-LX</td>
</tr>
<tr>
<td>GLC-ZX-SM</td>
<td>1000BASE-ZX</td>
</tr>
<tr>
<td>GLC-BX-U</td>
<td>1000BASE-BX-U</td>
</tr>
<tr>
<td>GLC-BX-D</td>
<td>1000BASE-BX-D</td>
</tr>
<tr>
<td>CWDM SFPs</td>
<td>8 CWDM SFP models</td>
</tr>
</tbody>
</table>

- GLC-T and GLC-GE-100FX SFPs are not supported
8-port Switch Positioning

Catalyst 3560 and 2960 Compact Switches

- Positioned for customers who want more intelligence at the network edge
- PoE, GE, Security, QoS, IPv6, SFPs, …

Catalyst 2940

- Positioned for customers who need standard connectivity
- No EoS plans for the Catalyst 2940
Catalyst 3750-E and 3560-E Series Switches
The Network Today

- **Gig to the desktop adoption increasing**
  - Gig uplinks to distribution become bottleneck
- **IT purchases face longer time in service**
- **VoIP deployments increasing**
  - Uptime more critical
  - Devices requiring PoE increasing
- **Collaboration and real-time communication application use growing**
  - User experience becomes top priority
  - Network system emerging as new platform for applications
  - Intelligent edge has become a competitive edge
Introducing The Catalyst 3750-E

- Complements the Catalyst 3750 Series
- 24 or 48 10/100/1000 ports
- All models have 2x10 GE uplinks
- PoE and data-only models
- Wire-speed performance
- StackWise Plus
  - Supports original StackWise features
  - Double the throughput of original StackWise
  - Backwards compatible with the Catalyst 3750
- Power
  - Modular power supply and fan
  - Multiple power supply options sizes
  - 48 ports of full IEEE POE in a single rack unit
  - Supported by new and improved redundant power system
Catalyst 3750-E and 3560-E Switch Models

Catalyst 3750-E Series Stackable Switches
- 24 10/100/1000T Ports + 2x 10GE
- 48 10/100/1000T Ports + 2x 10GE
- 24 10/100/1000T Ports w/POE + 2x 10GE
- 48 10/100/1000T Ports w/POE + 2x 10GE

Catalyst 3560-E Series Stand-Alone Switches
- 24 10/100/1000T Ports + 2x 10GE
- 48 10/100/1000T Ports + 2x 10GE
- 24 10/100/1000T Ports w/POE + 2x 10GE
- 48 10/100/1000T Ports w/POE + 2x 10GE

NDA Information
StackWise Plus

- 64Gbps Stacking Throughput*
- Local switching
- Backward compatible with the original StackWise
- Intelligently traffic forwarding
- Fault-tolerant, Bi-directional stack interconnection
- Automated Configuration & Management
- Single network instance (IP, SNMP, CLI, STPProtocol, VLAN)
- Master/secondary architecture with master failover
- Cross-Stack EtherChannel®, cross-stack QoS

* For typical traffic patterns, actual performance may be higher or lower

Unified Stacking, Behaving As a Single Unit
10 Gigabit Ethernet

- Two 10GE uplink interfaces
- Wire rate forwarding performance
- Supported X2 Transceivers
  - LX4 (MMF - 300m SMF - 10km)
  - LR (SMF 10km)
  - SR (MMF)
  - *CX4 (Copper)
  - ER (SMF 40km)

- TwinGig Adapter converts an X2 interface into dual SFP interfaces
- All SFPs supported on 3750 platform are supported with the TwinGig Adapter
- TwinGig Adapters are hot swappable with X2 modules

* Target Q2 2007
Field Replaceable Power Supplies

- Wide variety of power supply options
  - 48 port POE, 24 port POE, and data only options
  - DC power available in every model for data only
- With the RPS 2300, a power supply can be replaced without powering down the switch

<table>
<thead>
<tr>
<th>Cisco Catalyst 3750-E and 3560-E Series Switch</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C3K-PWR-1150WAC</td>
</tr>
<tr>
<td></td>
<td>C3K-PWR-750WAC</td>
</tr>
<tr>
<td></td>
<td>C3K-PWR-265WAC</td>
</tr>
<tr>
<td></td>
<td>C3K-PWR-265WDC</td>
</tr>
<tr>
<td>48-Port PoE Switch</td>
<td>✓</td>
</tr>
<tr>
<td>24-Port PoE Switch</td>
<td>✓</td>
</tr>
<tr>
<td>48-Port Switch</td>
<td>✓</td>
</tr>
<tr>
<td>24-Port Switch</td>
<td>✓</td>
</tr>
<tr>
<td>RPS 2300</td>
<td>✓</td>
</tr>
</tbody>
</table>
Redundant Power System – RPS 2300

- Seamless failover from switch to RPS when PS fails
- Automatic back-off to switch when its power supply returns
- RPS and switches support dual AC power circuits
- Connect up to six switches
- Two switches can be actively backed up
- Dual modular power supplies allow the RPS to match the switches’ supplies
- Field replaceable blower module

Backwards Compatible
Switches: 2950, 2960, 2970, 3550, 3560, and 3750
Routers: 2811, 2821, 2851, and 3825
Other Enhancements

- **Advanced Diagnostics**
  - Generic On-Line Diagnostics (GOLD)
  - On Board Failure Log (OBFL)

- **All models** have the ability to **route Jumbo Frames** up to 9216 byte sizes

- **All models** will have **two management ports**
  - RS-232 serial console port
  - 10/100BASE-TX Ethernet port for out-of-band management

- **Per Port PoE Power Sensing** measures actual power being drawn, enabling more intelligent control of powered devices

- **IPv6 Multicast routing** (future)
Positioning vis-à-vis 4948

- The 4948-10G are rack-optimized server switches:
  - Dual power supplies
  - Redundant fans
  - Larger buffers and TCAM

- The Cat 3750-E and 3560-Es are wiring closet switches:
  - Power over Ethernet
  - StackWise Plus
Catalyst Blade Switch 3020 for HP

Product Overview

Cisco Branded

No longer an OEM and now representative of Cisco technology in the Data Center

Customer Target

Data Center and Enterprise customers deploying HP Blade Servers

Product Overview

• Single SKU – 16+8 port GE switch
• Layer 2+ switch
• Up to 8 Uplinks - 4 SFP & 8 RJ-45 ports
Catalyst Blade Switch 3020 for HP

Front View

- 4 x SFP Uplink Ports
- 8 x RJ-45 Uplink Ports
- Console
- Port LEDs
Catalyst Blade Switch 3020 for HP

Switch Architecture

- Console Port
- Processor
- 32MB Flash
- 128 MB SDRAM
- TCAM
- ASICS

Ports:
- 16 Server Downlink ports
- 8 RJ-45 Ports
- 4 SFP Ports

Other:
- 2 Inter-Switch Connectivity Ports (if used, have 2 less uplink ports)
- 16 Server Downlink ports
Catalyst Blade Switch 3020 for HP
Switch Feature Set

**Spanning Tree**
- IEEE 802.1D, 802.1s, 802.1w
- PVST, PVST+, Rapid PVST
- Per-VLAN Rapid Spanning-Tree (PVRST+)
- PortFast, UplinkFast, BackboneFast
- Spanning-Tree Root Guard (STRG), UDLD

**Link Aggregation**
- IEEE 802.3ad with LACP
- EtherChannel using PAgP
- Dynamic Trunking Protocol (DTP)

**VLANs**
- IEEE 801.Q and Cisco ISL tagging
- VLAN Trunking Protocol (VTP)
- Dynamic Trunking Protocol (DTP)
- 1024 VLANs and 4000 VLAN IDs

**Advanced QoS**
- 802.1p CoS and DSCP field classification
- Cisco QoS ACLs
- Shaped Round Robin scheduling
- Cisco Committed Information Rate (CIR)

**Multicasting**
- IGMP snooping v1 & v2
- Multicast VLAN Registration (MVR)
- Per-port broadcast, multicast, and unicast storm control
- 1000 Configurable IGMP groups

**Security**
- TACACS+, RADIUS
- IEEE 802.1x
- Port-based ACLs (PACLs)
- SSHv1 & SSHv2, Kerberos, SNMPv3
- MAC address notification
- Protected port feature

**Management**
- Cisco Discovery Protocol (CDP)
- Cisco IOS CLI, CiscoWorks
- RMON 1 and II
- SNMPv1, SNMPv2c, and SNMPv3
- SPAN, RSPAN
- End-to-end Cisco, so common user I/F & software upgrade across entire switch network
Sample CBS3020
Layer 2 Trunk Failover Configuration

```
switch(config)# link state track 1
switch(config)# int range PO1, PO2
switch(config-if-range)# link state group 1 upstream
switch(config-if-range)# int range gig0/1 - 16
switch(config-if-range)# link state group 1 downstream
switch(config-if-range)# end

Note: PO1 is composed of gig ports 21 and 22
PO2 is composed of gig ports 23 and 24

These Etherchannels must be created separately prior to
creating the Layer 2 Trunk Failover Feature.
```
Alternate CBS3020
Layer 2 Trunk Failover Configuration

```
switch(config)# link state track 1
switch(config)# int PO1
switch(config-if)# link state group 1 upstream
switch(config-if-range)# int range gig0/1 -16
switch(config-if-range)# link state group 1 downstream
switch(config-if-range)# end
switch(config)#
```

Note: PO1 is the Etherchannel created previously
Cisco Network Assistant (CNA 5.0) on Ethernet Blade Switch

**Benefit:**
Manage multiple blade switches easily

**Cost:**
Free Tool

**What:**
- Mgmt Tool to allow Interactive Configuration, Topology/Front Panel View, Monitoring, Troubleshooting and Network Maintenance
- Supports up to 40 switches
- Examples:
  - Apply multiple port configs on multiple switches
  - Health Monitoring
  - OS upgrades
Catalyst 2960/3560/3750
IOS Roadmap
LLDP-MED - Spr ‘07

Superset of LLDP (standards based Link Layer Discovery)

When do we need LLDP-MED?

  For interoperability between Catalyst switches and 3rd party IP phones for VLAN and power exchange

Cisco on Cisco value proposition is still via CDP

  VLAN assignment
  Power Negotiation (granular bi-directional negotiation)
  AutoQoS - conditional trust boundary
  802.1x - authentication bypass for phones
  Emergency Responder and others..

LLDP-MED Location (Summer, 07)

  Location is configured on the switch
  Switch sends location to the IP phone using LLDP-MED
  Enables many location based services
  CDP support for location is on the roadmap
PIM Stub - Spr ‘07

**PIM Stub**

- Allows limited layer 3 multicast capabilities in IP Base
- Devices supported 3750/3650/3750-E/3650-E
- Access interfaces will not support PIM

Only direct-connected multicast (IGMP) receivers and sources are allowed for layer 2 access interfaces

- Routed Uplink ports will have full PIM support
- Designed for routed access deployed at access layer
Configuration Replace and Rollback
What and Why?

What is Config Replace?
- Replace the current running configuration file with a previously saved configuration
  - Without reload
  - Without CLI changes to the running configuration file
  - Therefore reducing system downtime
- Different than “copy source-url running-configuration”, which is a merge of the two configuration files
- Use “show archive config differences” to compare the file and only the diffs are applied

Why do I Care?
- Safe rollback / roll forward of IOS configuration files (full or partial) without reload of switch
- Simplify maintenance of IOS configurations files
- Reduce OPEX
Configuration Replace and Rollback Replacement Example 1

Router# configure replace disk0:routerJan-16-00:12:23.019-1
list

This will apply all necessary additions and deletions to replace the current running configuration with the contents of the specified configuration file, which is assumed to be a complete configuration, not a partial configuration. Enter Y if you are sure you want to proceed.

? [no]: Y

!Pass 1

!List of Commands:
no snmp-server community public ro
snmp-server community mystring ro
end

Total number of passes: 1
Rollback Done
Configuration Replace and Rollback
Replacement Example 2

Router# configure replace nvram:startup-config force

Total number of passes: 1
Rollback Done

- Reinstall the startup-config, without reload, and without reinserting all the startup-config command